Trends in Doctorate Recipients

Overall Numbers and Rates of Growth

During the 1998 academic year (July 1, 1997, through June 30, 1998), U.S. universities awarded a total of 42,683 research doctorate degrees,[3] marking the thirteenth straight year in which the absolute number of doctorates increased. The annual growth rate from 1997 to 1998, 0.3 percent, was the same rate as for the preceding year.[4] Over the past few years, the rate of increase has become markedly smaller than earlier in the decade. (See table 1.)

In absolute numbers, 42,683 represents an increase of 2,882 doctorates over the number for 1993 and is 9,183 more than in 1988.[5] For the 10-year interval between 1988 and 1998, U.S. universities collectively awarded almost 400,000 doctorates (397,048), as compared to a total of 316,413 for the preceding 10-year period. U.S. institutions have awarded more than one million doctorates (1,174,442) over the last 40 years, of which 33.8 percent were granted within the last 10 years (figures 1 and 2).

The aggregate figure for 1998 is the largest number ever for any single academic year: an increase of 2,882 doctorates or 7.2 percent higher than 5 years ago and 9,183 or 27.4 percent more than 10 years ago. Only the 17-year interval between 1957 and 1974 was a longer period of consecutive annual growth. (See figures 1 and 2.)

In general for the 1998 academic year, 58.2 percent of doctorate recipients were male, about two-thirds were U.S. citizens, and 62.7 percent were white. The typical recipient was slightly under 34 years of age at the time the degree was awarded. About three in ten recipients (29.2 percent) had never been married; 6.9 percent were either widowed, divorced, or separated; and 63.9 percent (66.0 percent for men and 60.9 percent for women) were currently married or

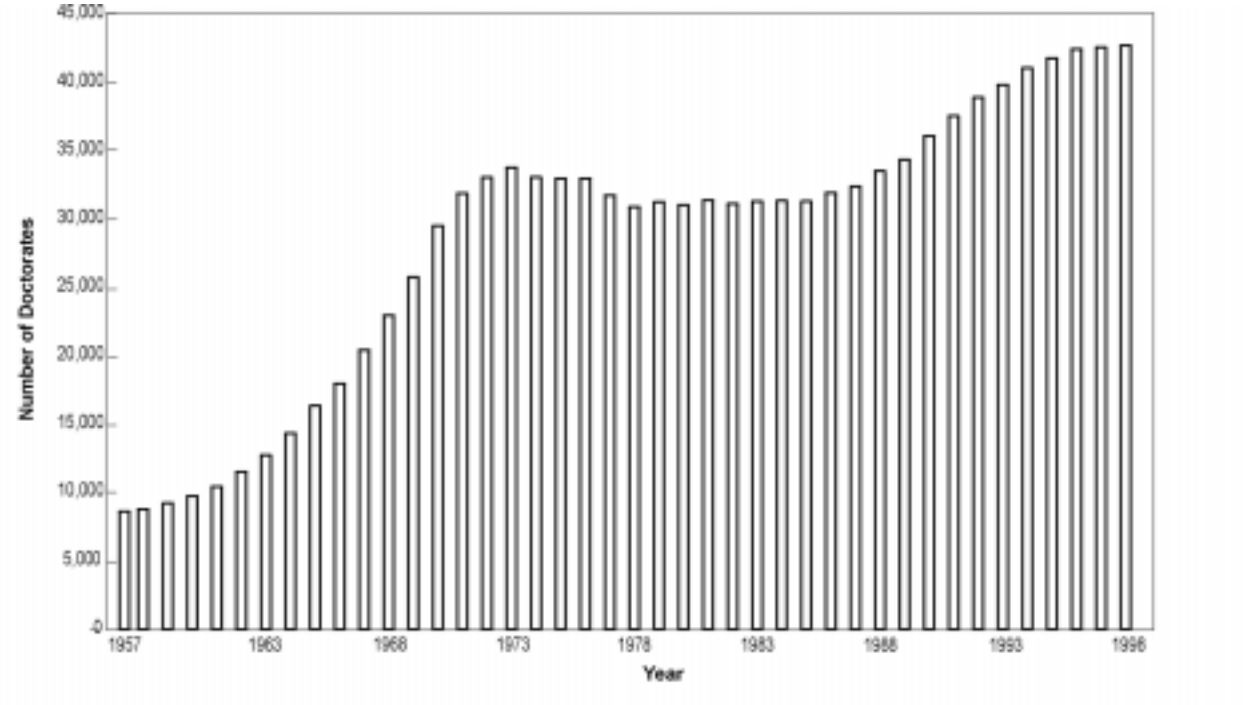
---

[3] Doctorates are reported by academic year (from July 1 of one year through June 30 of the following year) and include *research* and *applied research doctorates* in all fields. Doctoral degrees such as the Ph.D., D.Sc., and Ed.D. are covered by this survey; professional degrees (e.g., M.D., D.D.S., J.D., Psy.D.) are not. A full list of included degrees can be found in appendix E. For convenience throughout this report, "Ph.D." or "doctorate" are used to represent any of the doctoral degrees covered by the survey. Overall, 92.0 percent of all research doctorate degrees awarded in 1998 were Ph.D.s. The percentage of doctorates that are Ph.D.s differs by broad field of study (education, professional and "other" doctorates largely being not Ph.D.s, while traditional "arts and sciences" areas grant mostly Ph.D.s), and by factors associated with broad field of study, sex, racial/ethnic, and citizenship status, and institutional type.

[4] In the initial data release and the *Summary Report 1997: Doctorate Recipients from United States Universities* (Chicago: National Opinion Research Center, 1999), the total number of doctorates for 1997 was given as 42,705. Subsequent review of the data files revealed that 150 of the degree recipients counted in 1997 actually received their doctorates in 1998. Thus, the revised 1997 total is 42,555, or 0.3 percent lower than for 1998; the revised growth rate between 1996 and 1997 was 0.3 percent.

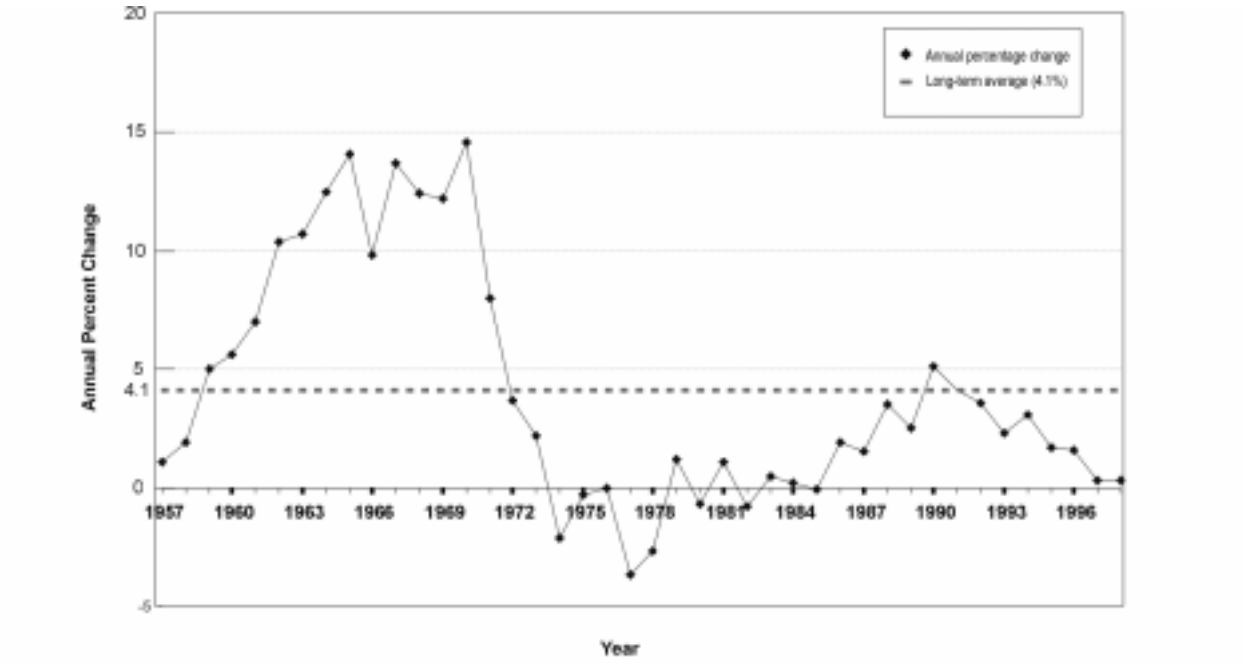
[5] Source of data for 5-year comparisons (1993-98) in this report is the *Summary Report 1993: Doctorate Recipients from United States Universities.* National Research Council Washington, DC: National Academy Press, 1995. Source of data for 10-year comparisons (1988-98) is *Summary Report 1988: Doctorate Recipients from United States Universities.* National Research Council. Washington, DC: National Academy Press. 1989.

Figure 1. Doctorates awarded by U.S. colleges and universities, 1957-1998



See Table 1 Source: NSF/NIH/NEH/USED/USDA, Survey of Earned Doctorates

Figure 2. Annual percent change in doctorates awarded by U.S. colleges and universities, 1957-1998



See Table 1 Source: NSF/NIH/NEH/USED/USDA, Survey of Earned Doctorates

living in a marriage-like relationship.[6] A decade ago the corresponding figures were higher percentages male, white, and U.S. citizenship; smaller percentage married; and the same approximate age at doctorate award. (See tables 7, 8, 11, A-3a and *Summary Report 1988.*[7])

Doctorate-granting Institutions, Doctorates per Institution, and Geographical Distribution

During the 1998 academic year, 387 colleges and universities in the United States and Puerto Rico awarded at least one research doctorate, as compared with 382 institutions granting doctorates in the 1997 academic year. The number of institutions increased steadily from the early 1960s (174 in 1961) until 1988 but has remained relatively level for the last few years. (See table 2.)

The mean number of doctorates awarded per institution in 1998 was 110, and the median was 45. As the difference between mean and median suggests, a relatively small number of institutions grant a disproportionately large number of doctorates. For example, only 115 institutions awarded more than the mean in 1998, but these 115 institutions granted an average of 296 doctorates each, accounting for 79.8 percent of all Ph.D.s earned in that 12-month period. The remaining 272 institutions awarded 32 doctorates on average in 1998. In terms of quartiles, the top 18 institutions accounted for 25 percent of all doctorates, the second quartile contained the next 29, the third quartile included 52 universities, and the remaining 288 were in the fourth quartile.[8]

The University of Texas at Austin granted 834 doctorates, or just under 2 percent of all doctorates awarded—the most Ph.D.s of any U.S. institution. The University of Wisconsin-Madison (760) and the University of California-Berkeley (748) were second and third. These same three universities, in the same order, also were the top doctorate-degree producers in 1997. The University of Minnesota (Twin Cities), University of Illinois (Champaign-Urbana), Ohio State University, University of Michigan, and UCLA round out the list of the top eight doctorate producers in recent years. Generally, either Harvard or Stanford follows the top eight in granting the next largest number of doctorates, the most for a private institution. In 1998 the leading 10 universities awarded 16.2 percent of all doctorates. (See table 3 and appendix table A-7.) Ten years ago the largest number of doctorates was awarded by the University of California-Berkeley (758), and the top 10 institutions together granted 17.7 percent of the 33,456 doctorates awarded.

With respect to broad field, the University of California-Berkeley awarded the most doctorates (156) in the physical sciences. MIT granted the most engineering doctorates (229), while the University of Wisconsin-Madison led all universities in granting doctorates in the life sciences (185). Nova Southeastern University awarded the most doctorates in both the social sciences (149) and education (298). Nova also granted the largest number of degrees in the

[6] Based only on the number with known status.

[7] See note 5 above.

[8] Calculations derived from appendix table A-7.

smaller, heterogeneous, "professional/other" category (58). The University of Texas-Austin was the leading granter of humanities doctorates (151). (See table 3 for the top 20 ranked institutions in each broad field.)

Doctorates granted by the top 10 institutions are concentrated in certain broad field areas. While these institutions accounted for 16.2 percent of all doctorates, they granted 19.1 percent of all Ph.D.s in the physical sciences, 27.7 percent in engineering, 18.1 percent in life sciences, 22.9 percent in humanities, and 21.0 percent in education. The lowest concentration was in the social sciences, in which the top 10 universities produced 15.4 percent of the doctorates.

For their doctoral studies, 68.4 percent of all new Ph.D.s attended public universities (for U.S. citizens that figure was 68.5 percent); 59.4 percent of the 1998 recipients who were U.S. citizens had earned their undergraduate degrees at public institutions.[9]

The 89 institutions in the Carnegie Research I classification[10] awarded 67.6 percent of all doctorates in 1998; the 37 Research II universities granted 11.2 percent of all Ph.D.s. In 1998, 10.5 percent of new Ph.D.s received their degrees at Doctoral I institutions; for Doctoral II institutions, the figure was 4.8 percent. The set of "other" Carnegie institutions awarded 5.8 percent of all doctoral degrees in 1998. (See figure 3.)

California universities awarded 4,731 doctorates (11 percent of the total). New York institutions granted the next highest number of doctorates (3,784), followed by institutions in Texas (2,736), Illinois (2,260), and Pennsylvania (2,234). These five states accounted for 36.9 percent of all doctorates awarded in 1998. Appendix table A-7 shows the aggregate and subfield distribution of 1998 doctorates by individual institution and state. Ten years ago, the top five states (with Massachusetts in place of Pennsylvania) accounted for 39.9 percent of the 33,456 doctorates awarded that year.

Doctorates by Broad Field

The SED classifies research doctoral degrees into some 290 fields of specialization (these are listed on pp. 8 and 9 of the questionnaire included in appendix D). For presentation purposes here, these are grouped into seven broad fields: physical sciences,[11] engineering, life sciences,[12] social sciences (including psychology), humanities, education, and a heterogeneous group of professional and other fields. The latter includes mainly business-related and public administration doctorates; and communications research, law, social work, theology, and library science. Information about the levels and trends by these broad fields of study is of particular interest to Federal sponsors of doctoral research, academic administrators, and professional

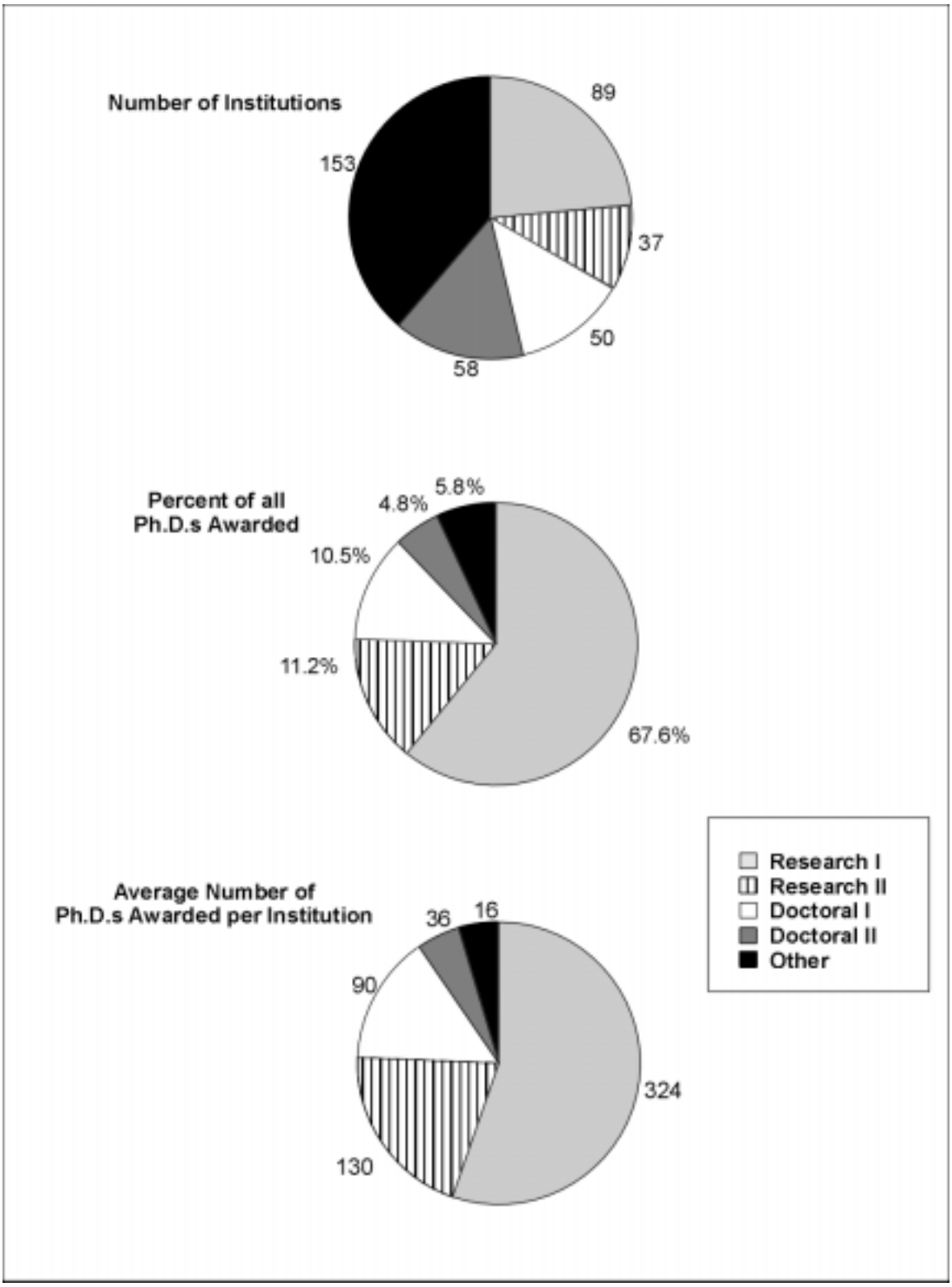
[9] Public-private institution comparisons at the undergraduate level would be meaningless for non-U.S. citizens, who overwhelmingly enrolled in baccalaureate programs outside the United States.

[10] See table 4 for a brief description of the Carnegie Foundation classification system and distributions.

[11] The physical sciences include mathematics and computer sciences, as well as the traditional physical sciences.

[12] The life sciences encompass biological, agricultural, and medical sciences.

Figure 3. Distribution of research-doctorate-granting institutions and doctorates by Carnegie classification, 1998



See Table 4: Source: NSF/NIH/NEH/USED/USDA, Survey of Earned Doctorates

associations, among others. These groups need such specialized data to make informed policy decisions influencing graduate education and the nation's labor force.

All seven broad fields show substantial gains in the number of doctorates for the 10-year interval of 1988–98. (See figures 4 and 5.) Although the overall rate of growth in Ph.D.s was 27.4 percent for that period, doctorates granted in the humanities field increased 54.7 percent (or 1,944 more doctorates), followed by engineering with a 41.4 percent increase (1,732) and the life sciences with a 38.5 percent increase (2,376). For the previous five-year interval (1993 -98), doctorates awarded in five of the broad fields increased but in education and the professional/other category, the number declined.

The four broad fields that together constitute "sciences and engineering (S&E)"—physical, life, and social sciences and engineering —showed a 1.9 percent annual increase in doctorates granted, an 8.2 percent gain over the past five years, and 31.9 percent more than were awarded in 1988. In 1998, these four fields yielded 66.2 percent of all Ph.D.s, a figure that has stayed fairly constant for the last four decades (it was 64.1 percent in 1968, 57.3 percent in 1978, and 64.0 percent in 1988).[13]

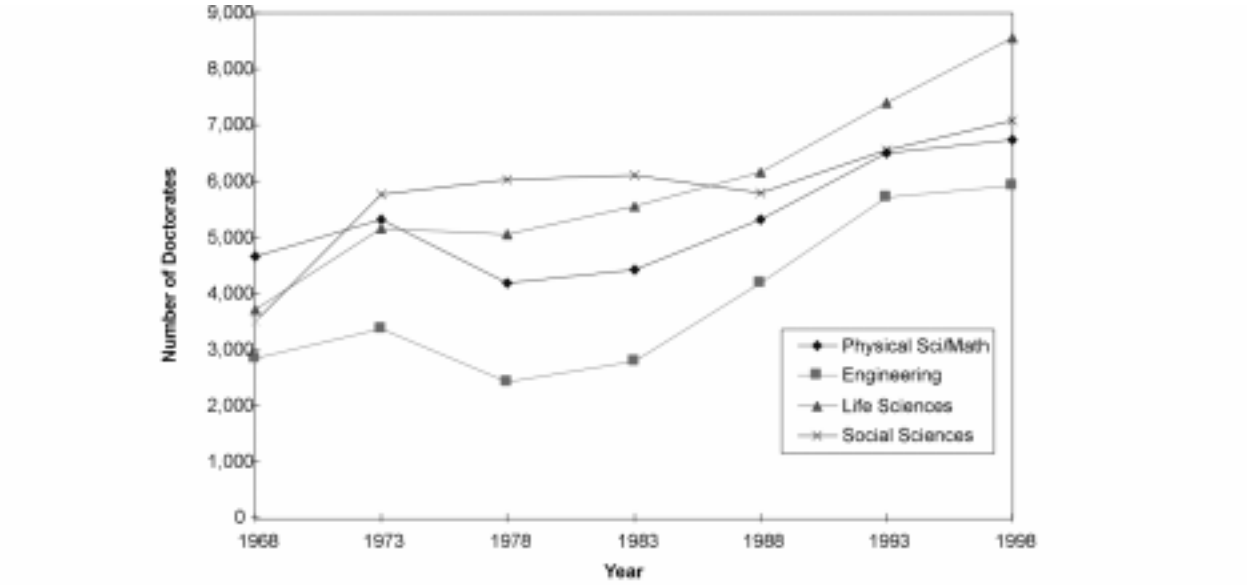
Thirty years ago, in 1968, more doctorates were awarded in physical sciences than in any other broad field, with education second. In 1978 and 1988, the largest number of doctorates were granted in education, with social sciences second in 1978 and life sciences second in 1988. For the 1998 academic year, life sciences was the broad field in which the most doctorates were awarded, followed by social sciences. (See figures 4, 5, and 6.)

In terms of groupings familiar to some graduate school deans—whose purview as academic administrators may not extend to engineering, education, and professional programs—65.3 percent of the 42,683 doctorates awarded in 1998 were in the "arts and sciences," a figure that has hovered around 65 percent for the last 40 years. Between 1997 and 1998, the physical and life sciences showed a 3.3 percent increase, compared with a 2.2 percent gain for the humanities and social sciences. Over 5- and 10-year intervals, the physical and life sciences showed gains of 10.0 percent and 33.2 percent versus 14.0 percent and 34.7 percent for the humanities and social sciences.

The absolute numbers and comparable percentage changes over the last decade for 25 selected subfields are given in table 6. In all instances the number of doctorates grew, although the amount of growth in these individual academic areas varied widely: from lows of 1.9 percent in the agricultural sciences and 9.9 percent in chemistry to a more than doubling in the neurosciences (155.9 percent) and molecular biology (104.7 percent). Within all four of the major engineering subfields—chemical, civil, electrical, and mechanical—the number of doctorates awarded also increased. Chemical engineering had the smallest percentage increase

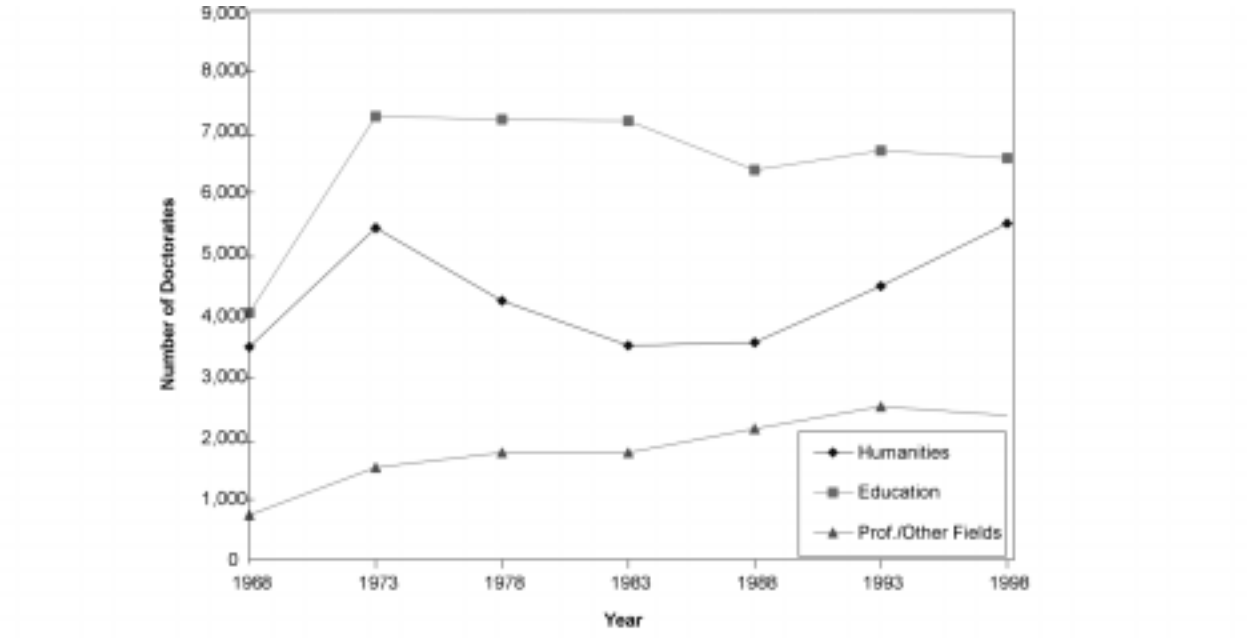
[13] Source of data for 20-year comparisons (1978-98) in this report is the *Summary Report 1978: Doctorate Recipients from United States Universities.* National Research Council Washington, DC: National Academy Press, 1979. Source of data for 30-year comparisons (1968-98) is *Summary Report 1968: Doctorate Recipients from United States Universities.* National Research Council., Office of Scientific Personnel. Washington, DC: National Academy of Sciences, 1969.

Figure 4. Science and engineering doctorates awarded by broad field, 1968-1998



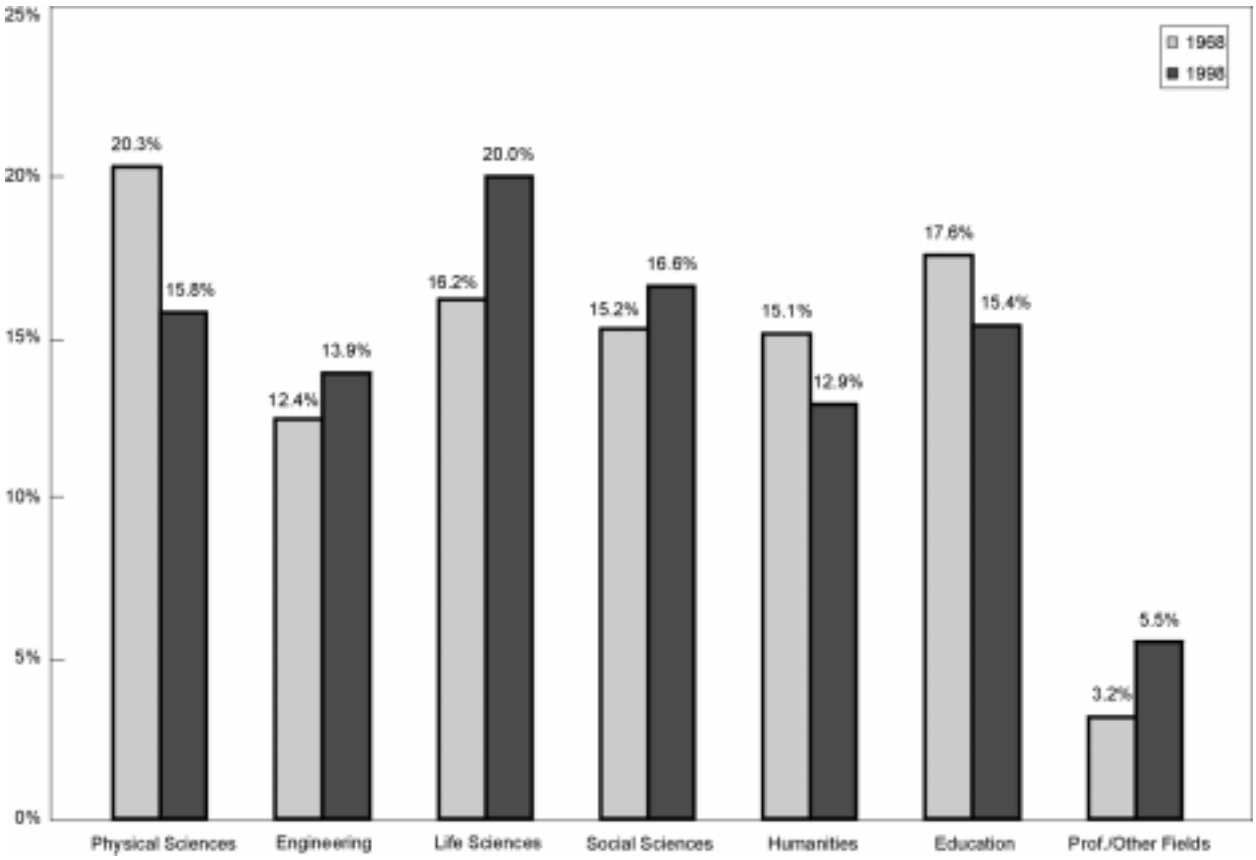
See Table 5. Source: NSF/NIH/NEH/USED/USDA, Survey of Earned Doctorates

Figure 5. Humanities, education, and professional/other doctorates awarded by broad field, 1968-1998



See Table 5. Source: NSF/NIH/NEH/USED/USDA, Survey of Earned Doctorates

Figure 6. Distribution of doctorate recipients by broad field, 1968 and 1998



See Table 5

Source: NSF/NIH/NEH/USED/USDA, Survey of Earned Doctorates

(6.7 percent) and electrical and mechanical engineering showed the largest gain (51.8 percent and 53.2 percent).

Doctorates by Sex

The aggregate percentage increase in doctorates earned between 1997 and 1998 (0.3 percent) is decidedly different when comparison is made by sex. In 1998, women received 17,856 Ph.D.s, the highest one-year total ever and a 1.4 percent gain over 1997. (See figure 7.) Females received 41.8 percent of all doctorate degrees granted, again the highest percentage ever; 1998 was the third consecutive year in which the representation of women was at least 40 percent. The absolute number of males earning doctorates declined for the second straight year—the 1998 total of 24,653 is 787 less than for 1996—and 1998 was the ninth consecutive year in which the overall male percentage declined. Over the last 40 years, from 1958 (when only 911 doctorates were awarded to women) to 1998, the rate of growth for male doctorates has

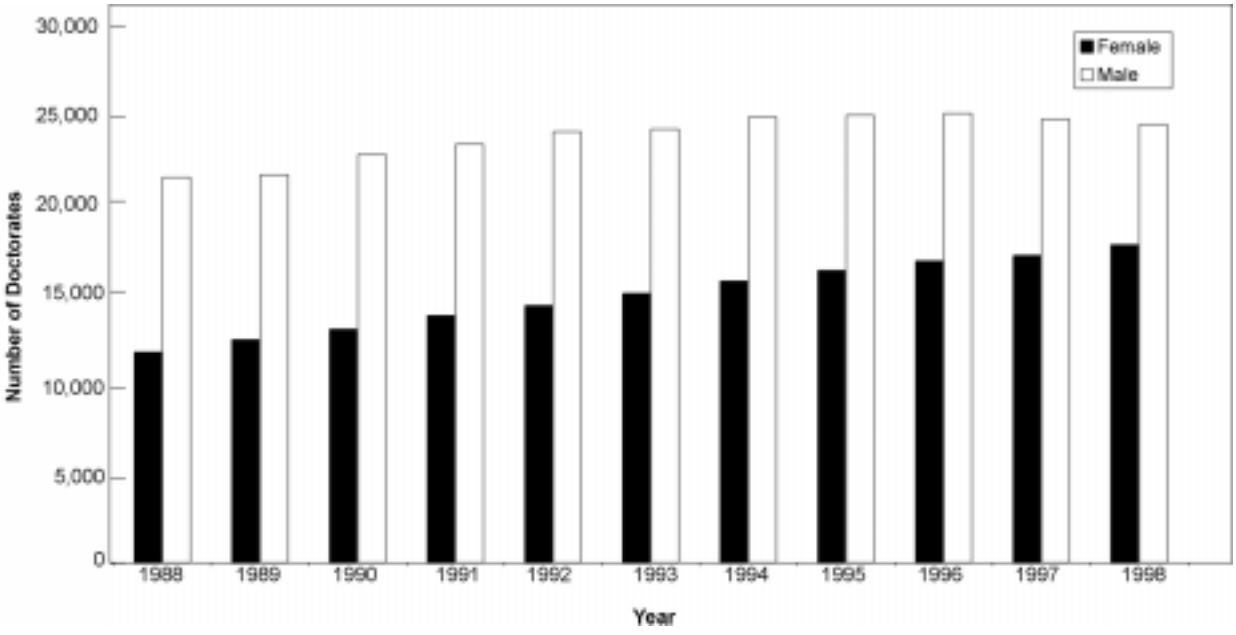
averaged just under 3 percent annually; over that same interval the rate of growth for female doctorates has been 7.5 percent per year.

The same long-term trend of increased female representation holds true for U.S. citizens, permanent residents, and those in this country on temporary visas. Absolute numbers of doctorates earned by females in all three categories increased between 1997 and 1998, while the numbers fell for males in the corresponding categories. Among U.S. citizens, the total number of doctorates earned by men and women in 1998 is very close to population parity: 47.7 percent of all doctorates were awarded to women. Ten years ago the female U.S.-citizen proportion of doctorate recipients was 41.1 percent, and 20 years ago it was only 29.1 percent.

Over that same 20-year time frame, female permanent resident recipients increased steadily from 21.7 percent in 1978 to 38.0 percent in 1998. Of doctorate recipients holding temporary visas, only 25.6 percent in 1998 were women. In 1988 females holding temporary visas constituted only 17.1 percent of doctorate recipients, compared with 13.3 percent 20 years ago. (See figure 7 and appendix tables B-2b and B-2c.)

The increase in absolute numbers and in percentage terms for women occurred in virtually every broad field. In the physical sciences, the area with the second smallest representation of women (the fewest women are in engineering), female doctorate recipients increased by 11.0 percent. Men showed percentage increases in four of the seven broad fields, although only in education was the male increase greater than the increase for females.

Figure 7. Doctorate recipients by sex, 1988-1998

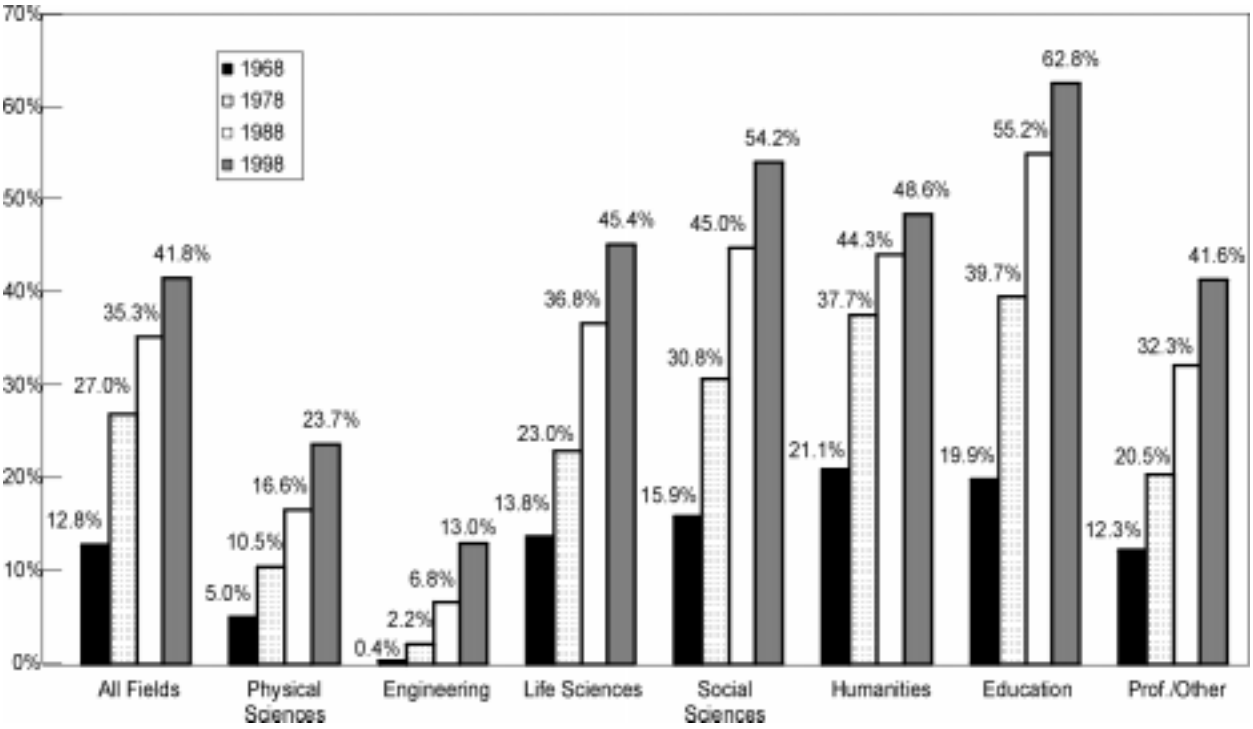


See Table 6

Source: NSF/NIH/NEH/USED/USDA, Survey of Earned Doctorates

In spite of both recent gains and the longer term trend, the distribution of doctorates by sex across the major fields remains decidedly bi-modal. In 1998, women received just 18.8 percent of all doctorates in physical sciences and engineering combined; across the other five fields they were, on average, in the majority—51.7 percent for all five combined. (See figure 8.)

Figure 8. Female doctorate recipients by broad field, 1968, 1978, 1988, 1998



See Table 7

Source: NSF/NIH/NEH/USED/USDA, Survey of Earned Doctorates

Within the subfields, representation by sex varies widely. (See table 6.) For example, in the physical sciences field, women received 31.3 percent of chemistry doctorates in 1998 but only 17.0 percent in computer sciences; in the life sciences, females earned 67.1 percent of all Ph.D.s in the health sciences (and 96.4 percent in nursing alone) but only 39.0 percent in ecology; within the major social science disciplines, the proportion of female doctorate recipients ranged from 27.4 percent in economics to 66.9 percent in psychology; and in the humanities, women received 75.0 percent of all art history doctorates compared with 29.4 percent in philosophy. (See table 6 and appendix table A-1 for additional subfield distributions by sex.)

Doctorates by Race/Ethnicity

For U.S. citizens the aggregate number of minority doctorate recipients rose between 1997 and 1998, from 3,845 to 4,014 (or by 4.4 percent).[14] This number is 35.8 percent higher than 5 years ago, 89.3 percent higher than 10 years ago, and more than double the 1978 figure (104.1 percent higher). If both U.S.-citizen and permanent-resident minority recipients are counted, the increases are 32.3 percent higher than 5 years ago, 94.1 percent higher than 10 years ago, and 111.2 percent higher than in 1978. These sizable increases are even more impressive when compared to the growth of doctorates earned by white U.S. citizens over the same period: Minority U.S. citizens received 2,047 more doctorates in 1998 than in 1978, while white U.S. citizens earned only 1,527 more. (See figures 9 and 10.)

While the overall rate of increase in doctorates between 1997 and 1998 was 0.3 percent, the number of doctorates decreased by 2.2 percent for U.S. citizens and permanent residents who were members of a racial or ethnic minority. However, that aggregate decline is misleading, as the percentage increased sizably for American Indians (13.9 percent), blacks (7.5 percent), and Hispanics (10.8 percent). The observed decline is due to a decrease in doctorates earned by Asian U.S. citizens (9.9 percent) and the even more pronounced decrease for permanent-resident Asians (14.4 percent).[15] (See appendix tables A-2 and B-2a as well as figure 9.)

Minority women earned 52.3 percent of Ph.D.s granted in 1998 to minority U.S. citizens. In three of the four groupings, female U.S. citizens earned slightly more than 50 percent of doctorates awarded to minorities—55.0 percent for American Indian women, 55.1 percent for Asian women, and 50.9 percent for Hispanic women. Black women, however, earned 64.6 percent of doctorates awarded to blacks. (See figure 11.)

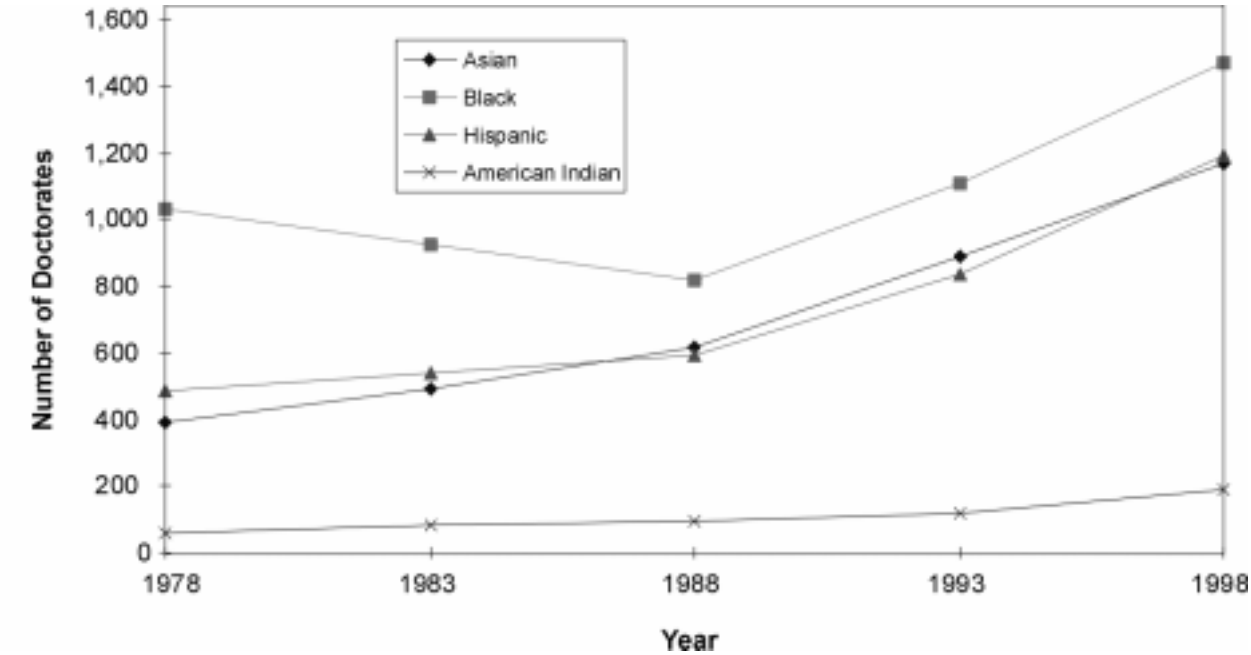
Overall in 1998, 42.9 percent of doctorates awarded to U.S. citizens and permanent residents were granted in the three broad fields of physical sciences, engineering, and life sciences. However, 69.8 percent of Asians receiving doctorates earned them in those three fields, as did more than 75 percent of non-U.S. citizens on temporary visas, the majority of whom are from Asian nations. By contrast, blacks accounted for only 23.2 percent of the doctorates awarded in these three fields. One broad field—education—accounted for 40.7 percent of doctorates received by blacks. More American Indians also earned doctorates in education (26.5 percent) than in any other field. The social sciences were the most popular field for Hispanics—23.8 percent of all doctorates awarded to Hispanics were in the social sciences. (See figure 12.)

---

[14] The SED questionnaire asks respondents to classify themselves as Hispanic, American Indian or Alaskan Native, Asian or Pacific Islander, black, or white. In this report, references to Asians include Pacific Islanders, and references to American Indians include Alaskan Natives.

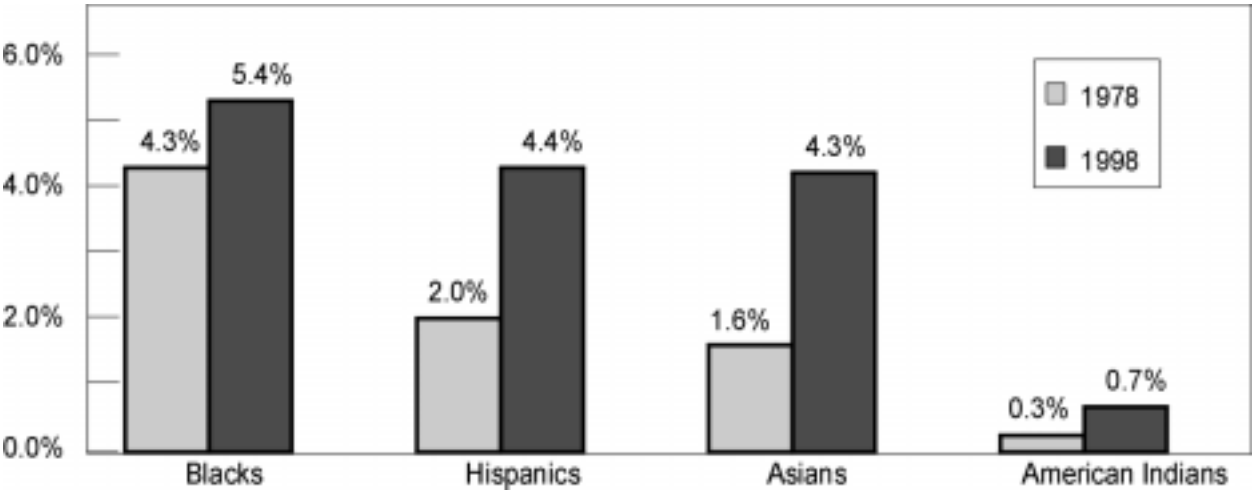
[15] More than 90 percent of blacks, Hispanics, and American Indians who earned doctorates are U.S. citizens, but only 42.9 percent of Asian doctorate recipients are U.S. citizens—the majority (57.1 percent) are permanent residents. Thus, when tracking race/ethnicity trends, one must distinguish between U.S. citizens and permanent residents.

Figure 9. Doctorates awarded to minority U.S. citizens by race/ethnicity, 1978-1998



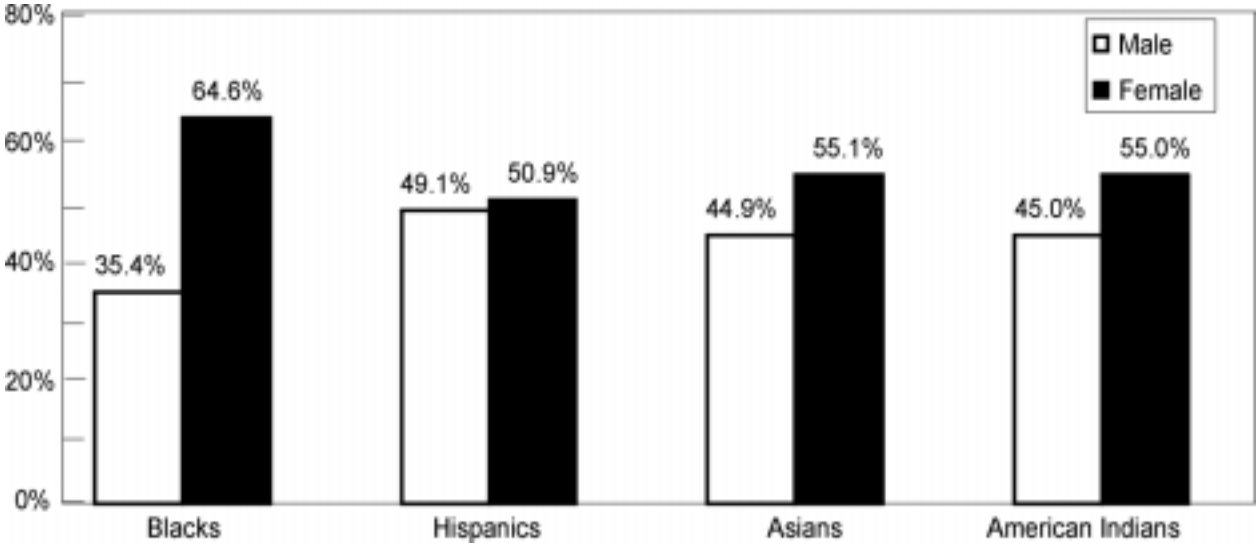
See Table 8 Source: NSF/NIH/NEH/USED/USDA, Survey of Earned Doctorates

Figure 10. Percentages of doctorates earned by minority U.S. citizens, 1978 and 1998



See Table 8 Source: NSF/NIH/NEH/USED/USDA, Survey of Earned Doctorates

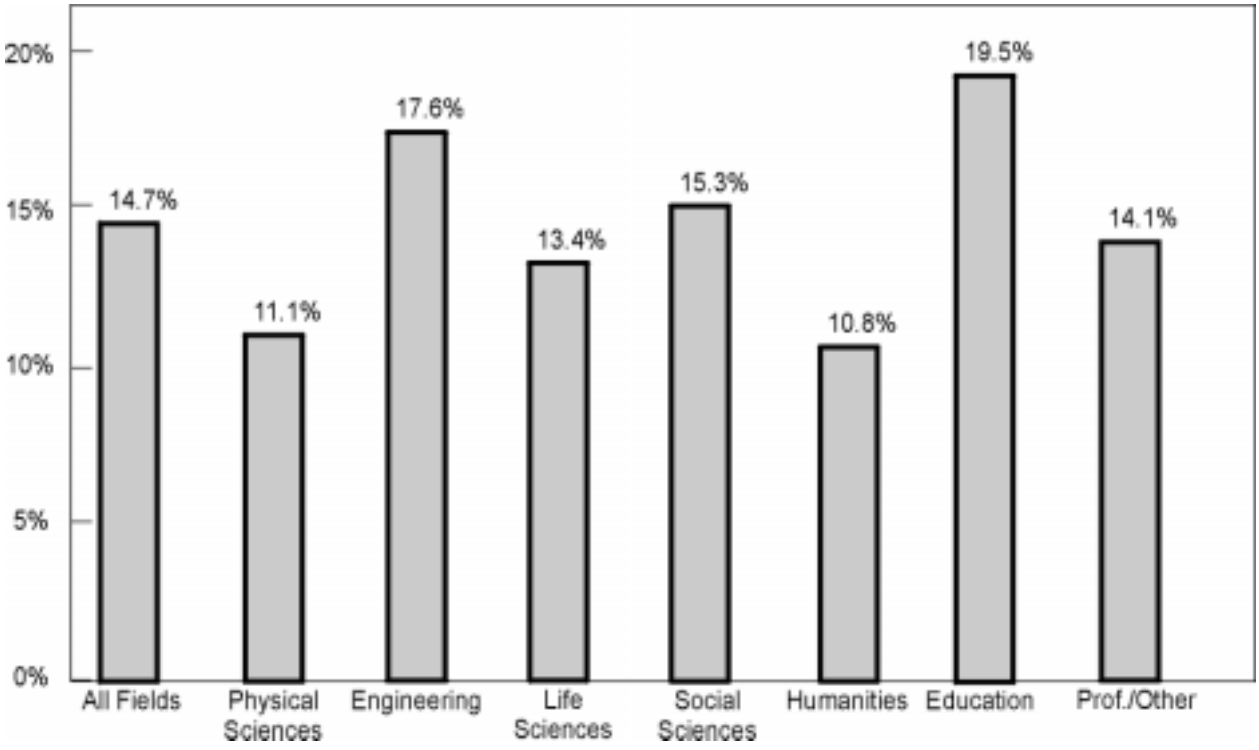
Figure 11. Distribution of doctorates earned by minority U.S. citizens by sex, 1998



Appendix Tables B-2b and B-2c

Source: NSF/NIH/NEH/USED/USDA, Survey of Earned Doctorates

Figure 12. Doctorates earned by minorities U.S. citizens by broad field, 1998



See Table 9

Source: NSF/NIH/NEH/USED/USDA, Survey of Earned Doctorates

Among U.S. citizens, Asian doctorate recipients increased between 1997 and 1998 only in the humanities; they declined in the other six broad field areas. Blacks showed increases in the physical sciences, social sciences, humanities, and education. The number of Hispanics receiving doctorates was larger in 1998 relative to 1997 in all four S&E fields and in education. The numbers for American Indians, while small, increased in all seven fields. By contrast, for white U.S. citizens, the total number of doctorates awarded between 1997 and 1998 increased in three fields—physical sciences, social sciences, and the humanities—and fell in the other four.

Table 10 lists the universities that awarded the most doctorates to each of the four minority groups over the last five years and the absolute number awarded. Three California institutions and two in Boston—Berkeley, UCLA, Stanford, Harvard, and MIT—granted the most Ph.D.s (18 percent) to Asian U.S. citizens over the 1993-98 time period. Nova Southeastern and Howard together granted 7.6 percent of all doctorates awarded to blacks in the last five years. Hispanics earned more doctorates at the University of Texas-Austin than at any other institution over this period. Ten universities—two in Texas, three in California, two in Puerto Rico, two in Arizona, and Harvard—awarded almost one-fourth (23 percent) of all doctorates to Hispanics. Oklahoma and Oklahoma State Universities led all institutions in the number of doctorates awarded to American Indians.

The concentration of doctorates earned by U.S. minority students from these particular institutions is much higher than the concentration by entire population, citizenship, or broad field. Although the overall top 10 institutions awarded 16.2 percent of all doctorates (see appendix table A-7), the top 10 institutions in each racial/ethnic category accounted for 28.5 percent of Asian doctorate recipients, 41.0 percent of black recipients, 21.0 percent of Hispanic recipients, and 20.4 percent of American Indian recipients. (See table 10.)

Doctorates by Citizenship

Approximately one-fifth of all doctorates granted in 1998 were awarded to non-U.S. citizens in this country on temporary visas. In absolute numbers, this group earned 8,642 doctorates. (See appendix table A-4.) However, of the 42,683 total doctorates awarded, citizenship is unknown in 3,127 cases. Consequently, the 8,642 figure is 20.2 percent of all doctorates and 21.8 percent of doctorate recipients whose citizenship is known.

If all of the “unknowns” were on temporary visas, which is highly unlikely, the percentage would rise to 27.6 percent. These three percentages bound the true representation of international students earning doctorates at U.S. institutions. The corresponding percentages were similar in 1997: 19.9 percent of all doctorate recipients, 21.6 percent of recipients of known citizenship status, and 27.5 percent of all recipients assuming all unknowns were on temporary visas. Ten years ago, these percentages were 18.5 percent, 19.9 percent, and 25.6 percent.

The trend over the last decade is consistent—the percentage of non-U.S. citizens earning doctorates from U.S. universities has inched up modestly. By contrast, in the decade before (1978-88), the increase in international doctoral students was much larger. For 1978 those same percentage bounds ranged from 11.1 percent to 13.7 percent, or about half of the 1998 figures.

Stated another way, while the number of U.S. citizens receiving doctorates in 1998 was approximately 3,000 higher than the corresponding total in 1978, the number of doctorates awarded to students on temporary visas in 1998 was more than 5,000 higher than 20 years earlier. (See table 11.)

Permanent U.S. residents (that is, non-U.S. citizens on permanent visas, or holding a "green card") have also increased in absolute and relative terms among the doctorate population. In 1978 they represented 4.5 percent of all doctorate recipients with known citizenship; in 1988 that percentage was 5.2 percent, and in 1998 it was 6.8 percent.

Although temporary visa holders were 21.8 percent of doctorate recipients whose citizenship was known, their percentages by broad field varied considerably. For example, these non-U.S. citizens earned 44.2 percent of all engineering doctorates, 32.6 percent of the physical sciences doctorates, and 24.4 percent of the life sciences doctorates. (See table 11 and appendix table A-2.) For the S&E fields as a whole, non-U.S. citizens made up 27.9 percent of the doctorate population. Viewed from a different perspective, the numbers indicate that 27.7 percent of all doctorate recipients on temporary visas earned their degrees in engineering, followed by 23.6 percent earning doctorates in the physical sciences and 22.5 percent in life sciences; 84.4 percent of all doctorates granted to non-U.S. citizens on temporary visas were earned in S&E fields.

The People's Republic of China continues to outdistance other nations as the country of origin for non-U.S.-citizen doctorate recipients. Fully 6 percent, or 2,571, of all doctorate recipients in 1998 were citizens of China. India was second (with 1,259, or just under 3 percent), followed by Taiwan, Korea, and Canada. Fifteen percent of all doctorate recipients were citizens of these five countries, and they constituted more than 50 percent of all non-U.S. citizens receiving doctorates. The top 30 countries of origin of doctorate recipients who were non-U.S. citizens on temporary visas in 1998 are listed in table 12.

Table 13 lists the institutions awarding the largest number of doctorates to non-U.S. citizens, with the University of Texas-Austin granting the highest number (249). In percentage terms—that is, relative to the total number of doctorates awarded—the New Jersey Institute of Technology leads all institutions. (See table 14.)

Doctorates by Parental Education Background

In addition to the distribution of doctorate recipients by sex, race/ethnicity, and citizenship, the SED categorizes new Ph.D. recipients by family and personal background: geographic origins (see a discussion of this topic in the section on postgraduate plans), marital status and dependents, disability status, and the level of educational attainment by recipients' parents. Only the last is discussed in this section.

In 1998, of doctorate recipients as a whole, 28.3 percent came from families in which the father had a high school education or less; for 37.1 percent of recipients, the mother had a high school education or less. More than 40 percent (40.3) of the fathers of doctorate recipients had an

advanced degree,[16] compared with 27.9 percent of the mothers. In 23.4 percent of the households, both parents held advanced degrees, but in a comparable number of families—23.0 percent—both the father and mother had high school education or less. (These percentages and all of the discussions that follow are based on data from table 15.)

These distributions vary widely by citizenship. For example, the percentage of doctorate recipients who had fathers and/or mothers with a high school education or less is lowest for U.S. citizens and highest for students holding temporary visas. As might be expected, the opposite is true for families in which parents held advanced degrees—U.S. citizen students had the highest percentage of parents holding advanced degrees and students studying on temporary visas had the lowest percentage.

Comparing by race/ethnicity, white doctorate recipients had the lowest percentages of fathers (27.0 percent) and mothers (34.3 percent) with a high school education. Black doctorate recipients had the highest percentage of fathers with a high school diploma or less (53.1 percent). Hispanics (52.6 percent) and blacks (51.9 percent) showed the highest percentages of mothers with a high school diploma or less.

Male and female doctorate recipients come from families in which the parents had similar educational backgrounds. For the families of male doctorate recipients, 29.0 percent of the fathers had a high school education or less, whereas 39.4 percent of the fathers held advanced degrees. For female Ph.D.s, those percentages are 27.5 percent having fathers with a high school education or less and 40.9 percent of fathers holding advanced degrees. Slightly more of the mothers of female doctorate recipients, as compared to mothers of male Ph.D.s, held advanced degrees (28.9 percent versus 26.7 percent) and fewer of the mothers had high school education or less (34.5 percent versus 39.2 percent).

The educational attainment of parents differs among students in the various broad fields. Doctoral recipients in the humanities and social sciences had the highest percentage of fathers with advanced degrees (46.5 percent and 45.7 percent), while doctorate recipients in the field of education had the lowest percentage of fathers with advanced degrees (29.1 percent). The distributions rank in the same order for mothers of recent Ph.D.s.

Time to Degree

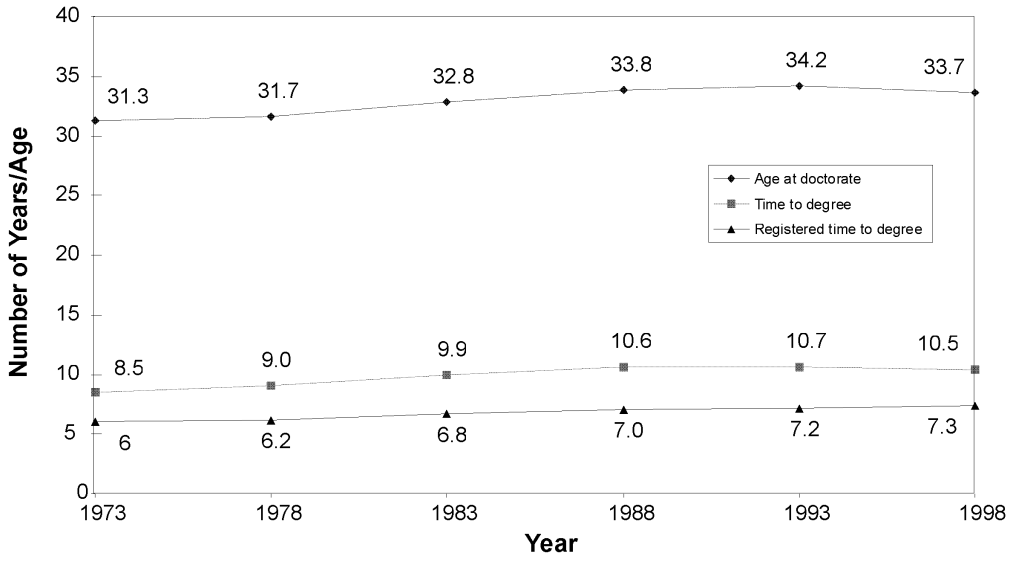
The median 1998 doctorate recipient graduated from high school in 1980, at age 18, was about 34 (33.7) years of age when receiving his or her doctoral degree, and had been enrolled on a full-time basis for 6 years in the doctoral program. Women were, on average, about 18 months older than their male counterparts (34.8 years of age versus 33.1 years for males). While two-thirds (67.9 percent) of recent Ph.D.s received their high school diploma at 18 years of age, 3.8 percent were 16 years old or younger, and 2.4 percent were at least 20 years old.

The amount of time taken by doctoral students to earn their degrees can be expressed in several ways. The survey collects data on three statistics in particular: (1) the elapsed time

[16] Advanced degree is defined as a master's degree, professional degree, or doctorate.

between receipt of the baccalaureate and conferring of the doctorate; (2) the number of years actually registered in a doctoral program; and (3) the age at which the doctorate was awarded. None of these "clock times" is necessarily an accurate measure of the time and effort required to complete a doctorate, for each measure can be affected by such factors as the job markets for new doctorates, child care responsibilities, or requirements governing access to loans (and the repayment schedule) and health insurance through the university. Nevertheless, taken together, these three offer a complementary picture of the path and process of doctoral study. (Tables 16, 17, and 18 and figures 13 and 14 provide the data and graphical illustrations for the discussion on time to degree below, both for 1998 levels and longitudinal comparisons.)

Figure 13. Median number of years to doctorate from baccalaureate award and age at doctorate, 1973-1998

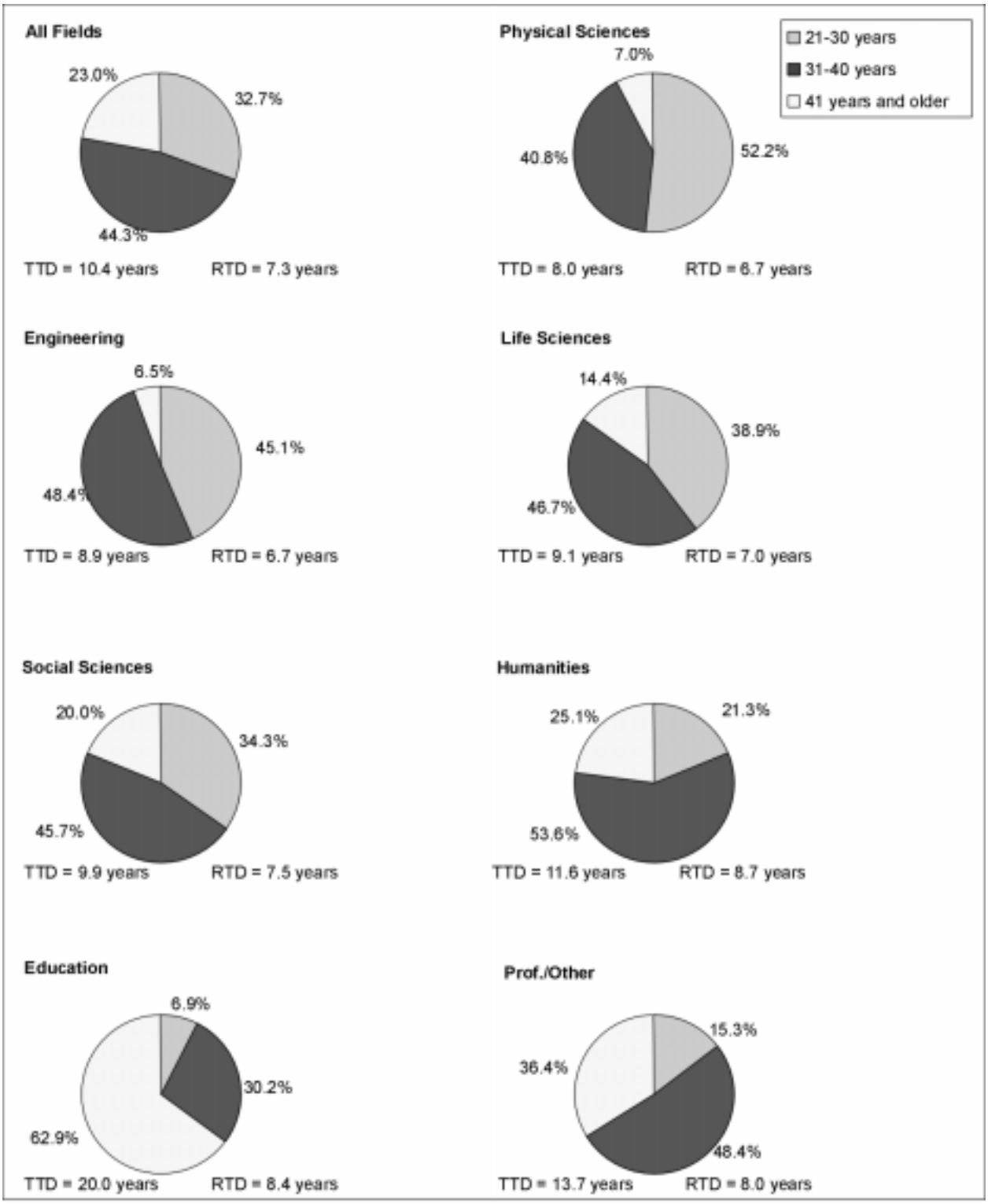


See Table 16

Source: NSF/NIH/NEH/USED/USDA, Survey of Earned Doctorates

Doctorate recipients in the physical sciences had the shortest total time to degree (8.0 years) for students in any of the seven broad fields of study, with engineering Ph.D.s second (8.9 years); both fields had the lowest registered time (6.7 years). Within the general arts and sciences areas, humanities students took the longest median time to earn their doctorates (11.6 years), and they were registered for the longest period as well (8.7 years). Overall, education doctorate recipients had the longest average time to degree (20.0 years), although they were actually registered in their doctoral program for less than half of that time (8.4 years). (See figures 13 and 14.)

Figure 14. Age distribution at doctorate by broad field of study



See Table 18

Source: NSF/NIH/NEH/USED/USDA, Survey of Earned Doctorates

For 1998 doctoral recipients, the median number of years from the baccalaureate to the Ph.D. was 10.4 years (compared with 10.5 years for the 1997 doctoral cohort and 10.8 years in 1996). The registered time to degree was 7.3 years; it was also 7.3 years in 1997 and was 7.2 years in 1996. Because males and females, U.S. citizens and non-citizens, and members of various ethnic/racial groups are not distributed in the same proportions across academic disciplines, total and registered times can vary by sex, race/ethnicity and citizenship.

For example, males are more likely to be in the physical sciences, engineering, and life sciences, where both total and registered times to degree are lower than in other areas; females are overrepresented in the social sciences, humanities, and education, where both time-to-degree medians are higher. The aggregate difference in total time to degree (9.9 years for males versus 11.3 years for females) or registered time to degree (7.2 years for men versus 7.6 years for women) is largely attributed to the distributions by sex across these fields of study; within a specific field, median times are higher for women in some areas and lower in others.

Distributions by actual age at receipt of the doctorate are consistent with the other two time-to-degree measures. For the physical sciences, engineering, and life sciences, the modal age grouping is 26-30 years of age; for the social sciences and humanities, it is 31-35 years; and for education, it is the open-ended “over 45 years” category. (See table 18 and figure 14.)

Overall, non-U.S. citizens holding temporary visas have shorter total and registered times to degree (9.5 years and 7.0 years) than do U.S. citizens or permanent residents. (See table 17.) Again, this is a function of the distributions by citizenship status across the various fields. Because of their disproportionate representation in the S&E fields, non-U.S. citizens holding temporary visas on average complete their degrees when they are about two years younger than U.S. citizens. However, for each individual S&E category, total time to degree is shorter for U.S. citizens than for those on temporary visas; that pattern generally (but not universally) holds true for registered times as well.

Within the U.S citizen category, Asians have the shortest and blacks the longest total and registered times, but there are no systematic differences within field by race/ethnicity.